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Original Article

BIO-EFFICACY OF NEW INSECTICIDE MOLECULES AGAINST SPODOPTERA LITURA (FAB) AS POISON BAIT IN GROUNDNUT

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ABSTRACT

An investigation to study the evaluation of new insecticide molecules against Spodoptera litura (fab.) as poison bait in laboratory experiment was conducted during 2013-14, at University of Agricultural Sciences, Raichur. The bait was used for preparation of poison bait is oiled and de-oiled rice bran. The two sets of new insecticides tested in the poison baits were (Set-1: lambda cyhalothrin 5 EC, profenofos 50 EC, chlorpyriphos 20 EC, novaluron 10 EC, methoxyfenozide 20 SC; Set-2: indoxacarb 14.5 SC, chlorfenapyr 10 SC, fipronil 5 SC, spinosad 45 SC and chlorantraniliprole 18.5 SC) along with the standard insecticide monocrotophos 36 SL, in levels lower than their recommended field dosages. The result revealed that, poison bait prepared with oiled rice bran was higher per cent mortality than the de-oiled rice bran was recorded. The result revealed that, chlorfenapyr bait with oiled rice bran bait all four dosages (100, 75, 50 and 25 per cent of recommended dosage) was recorded cent per cent mortality and was significantly superior over all other treatments at 72 hours after exposure of larvae to the baits. Next to follow were chlorpyriphos 20 EC and profenofos 50 EC. Chlorfenapyr bait with de-oiled rice bran bait at 100 and 75 per cent of recommended dosages were found statistically superior by recording cent per cent mortality. Next to follow was monocrotophos at 100 per cent of recommended dosage (80.00) and was found to be statistically superior to rest of the treatments.

KEYWORDS: Groundnut, Poison Bait, De-Oiled Rice Bran, Spodoptera litura, Chlorfenapyr

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INTRODUCTION

Groundnut belongs to the family leguminacae and designated as "*wonder legume*" in the sense that after flowering, fertilization and fruit set, the pegs (*gynophore*) elongate and penetrate the soil where the fruit develops and mature in soil. It is an annual legume native to South America. *Spodoptera litura* (Fab.) (Lepidoptera: Noctuidae), commonly known as tobacco caterpillar in India is a remarkable features such as polyphagous feeding habit, high reproductive potential, overlapping generations, year round availability of host plants, ability of adults to migrate over large distances and frequent control failures with most of the routinely used insecticides.

Management practices early instar larvae spraying of the insecticides and poison baits are used for grown up larvae because they hide during day time near the base of the plants and cause damage during night time, insecticide spray will not reach the target pest and has become difficult to manage the pest. Baiting is a technique that uses an attractive food to lure insect pests to an insecticide (poison) rather than treating an entire area. The poison bait containing monocrotophos was found superior in causing mortality compared to spraying and dusting of

some other chemicals. Also, the poison bait was highly effective in killing a large number of armyworm moths (Hiremath *et al.,* 1990).

But, the recent development of keeping of monocrotophos under restricted use in some crops by Central Insecticide Board and Registration Committee (Anon., 2005) and arrival of less toxic insecticides for use in pest management necessitates investigations on efficacy of alternate toxicant molecules to be used in the preparation of poison baits. The rice bran bait recent year costly and it is used for oil extraction. Therefore the possibility use of de-oiled rice bran for the bait preparation and cheaper than rice bran and cost effective.

MATERIALS AND METHODS

The experiments were conducted at Department of Agricultural Entomology, College of Agriculture, Raichur during 2013 – 14. For the bait preparation, the procedure adopted by Hiremath *et al.* (1990) was used with alterations in terms of the toxicant chemical. According to the procedure followed by Hiremath *et al.,* (1990), poison bait consisted of 50 kg rice bran, 625 ml monocrotophos 36 SL and four kg jaggery dissolved in eight liters of water (1 ha). Fifty kg of rice bran will be spread on the hard floor and four kg of jaggery is dissolved in two liters of water and sprinkled on the bran evenly. Later, the required quantity of poison was dissolved in two liters of water and sprinkled on the bran. Afterwards, four liters of water was poured into the mixture and mixed thoroughly stirred properly. Later, this mixture was transferred to gunny bags and kept for 48 hours for fermentation.

For the evaluation of bio-efficacy two sets of insecticides were selected (Tables 1 and 2). In each set four concentrations of five insecticide molecules were studied in comparison with the untreated control and standard check (monocrotophos 36 SL). Poison bait was prepared both oiled and De-oiled rice bran. Larvae of *Spodoptera litura* (Fab.) were collected from the field and reared in the laboratory in artificial diet. The fourth instar larvae were used for the experiments.

After the preparation, poison baits were kept in small gunny bags for 48 hours for ensuring fermentation. Later 100 g of poison baits were spread into plastic boxes with meshed lid and the lab reared fourth instar larvae of *S. litura* were released into it @ 15 larvae per box and 100 g mixture of rice bran and jaggery without insecticide was also kept as control. Observations were recorded on larval mortality at 12, 24, 48 and 72 hours after the release of larvae into the boxes containing poison baits. Mortality percentages were worked out and data were analysed by Duncan's multiple range test after angular transformation.

RESULTS AND DISCUSSIONS

The data presented in Table 3 indicate that efficacy of poison baits with oiled rice bran in causing mortality of *S. litura* larvae after 72 hours after treatment, in set-I revealed that chlorpyriphos at 100 and 75 per cent of recommended dosages were found statistically superior giving cent per cent mortality (Table 3). Next to follow were monocrotophos at 100 and 75 per cent of recommended dosage, profenofos at 100 per cent of recommended dosage, monocrotophos at 50 per cent of recommended dosage The data presented in Table 4 indicate that efficacy of poison baits with oiled rice bran in causing mortality of *S. litura* larvae after 72 hours after treatment, in set-II revealed that all four dosages of chlorfenapyr were found superior recording cent per cent mortality (Table 4). Next to follow were monocrotophos at 100, 75 and 50 per cent of recommended dosage (97.78, 95.56 and 80.00%, respectively), indoxacarb at 100 cent of recommended dosage (75.56%), chlorantraniliprole at 100 per cent of recommended dosage (98.89%).

The present results agreement with Renju *et al.* (2009) on efficacy of chlorpyriphos bait against *M. separata* under laboratory conditions. They could get cent per cent mortality of larvae when exposed for 48 hours to chlorpyriphos bait and also observed increase in mortality with increase in time of exposure. Similar results were also observed by Viswanadham *et al.* (1986); Chandrasekhar (1992) using spray of chlorpyriphos under laboratory conditions against *S. litura*. There are no reports available on the efficacy of chlorfenapyr bait on the larvae of *S. litura* under laboratory conditions. However, Shashibhushan *et al*. (2010) from Andra Pradesh reported that chlorfenapyr 10% SC (2ml/l) was recorded lower tuber damage (6.45%) and Carbaryl bait (4.61%) against *Spodoptera litura* on potato during Raby 2006-07 and 2007-08 from November to January. Similar result reported by Venkateswarlu *et al*. (2004).

The data presented in Table 5 indicate that efficacy of poison baits with De-oiled rice bran in causing mortality of *S. litura* larvae after 72 hours after treatment, in set-I revealed that chlorpyriphos at 100 and 75 per cent of recommended dosages were found statistically superior by recording cent per cent mortality. Next to follow was monocrotophos at 100 per cent of recommended dosage (80.00) and was found to be statistically superior to rest of the treatments. The other treatments viz; monocrotophos at 75 per cent of recommended dosage (75.56%) was statistically at par with novaluron at 100 per cent of recommended dosage (73.33%)..

The data presented in Table 6 indicate that efficacy of poison baits with De-oiled rice bran in causing mortality of *S. litura* larvae after 72 hours after treatment, in set-II revealed that chlorfenapyr both at 100 and 75 per cent of recommended dosages were found to be statistically superior to rest of the treatments by recording cent per cent mortality, followed by chlorfenapyr at 50 per cent of recommended dosage (97.78%) which also proved to be statistically superior to rest of the treatments. The lowest dosage i.e., 25 per cent of recommended dosage of chlorfenapyr (82.22%) was statistically at par with 100 per cent of recommended dosage of monocrotophos (80.00%). However, there are no such studies with de-oiled rice bran bait to discuss.

CONCLUSIONS

Based on the results summarized above, it is concluded that among the tested insecticides baits chlorfenapyr was recorded as highest mortality in both rice bran and de-oiled rice bran, followed by chlorpyriphos 20 EC and profenofos 50 EC. All four dosage of toxicants used in poison baits, 75 per cent of recommended dosages proved to be effective vis-a-vis 50 and 25 per cent. De-oiled rice bran poison bait was also effective against *Spodoptera* larvae under laboratory condition. Therefore, the same can also be exhibited to minimize the cost of the bait.

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APPENDICES

Table 1: Insecticides Used for the Preparation of Poison Baits for Laboratory Experiments (Set-I)

Insecticides	Recommended Dosages for Sprays	Recommended Dosages for 100g of POISON Bait	Amount of Chemicals Required for Preparation 100g of Poison Bait		
			75%	50%	25%
Lambda cyhalothrin 5 EC	0.50 ml/l	0.625 ml/100 g	0.468 ml	0.312 ml	0.156 ml
Profenophos 50 EC	2.00 ml/l	2.5 ml/100g	1.875 ml	1.25 ml	0.625 ml
Chlorpyriphos 20 EC	2.00 ml/l	2.5 ml/100g	1.875 ml	1.25 ml	0.625 ml
Novaluron 10 EC	0.75 ml/l	0.930ml/100 g	0.703 ml	0.468ml	0.234 ml
Mehoxyfenozide 20 SC	1.00 ml/l	1.25 ml/100 g	0.937 ml	0.625 ml	0.312 ml
Monocrotophos 36 SL	1.00 ml/ l	1.25 ml/100 g	0.937 ml	0.625 ml	0.312 ml
Control					

Control: 100 g mixture of rice bran and jaggery without insecticide.

Table 2: Insecticides Used for the Preparation of Poison Baits for Laboratory Experiments (Set-II)

Insecticides	Recommended Dosages for Sprays	Recommended Dosages for 100g of Poison Bait	Amount of Chemicals Required for Preparation 100g of Poison Bait		
			75%	50%	25%
Indoxacarb 15 EC	0.30 ml/l	0.375 ml/100 g	0.28 ml	0.187 ml	0.093 ml
Chlorfenpyr 10 SC	1.0 ml/l	1.25 ml/100 g	0.937 ml	0.625 ml	0.312 ml
Fipronil 5 SC	1.0 ml/l	1.25 ml/100 g	0.937 ml	0.625 ml	0.312 ml
Spinosad 45SC	0.2 ml/l	0.25 ml/100g	0.187 ml	0.125 ml	0.062 ml
Chlorantriniprol 18.5 SC	0.25 ml/l	0.312 ml/100 g	0.23 ml	0.156ml	0.0781 ml
Monocrotophos 36 SL	1.0ml/ l	1.25 ml/100 g	0.937 ml	0.625 ml	0.312 ml
Control					

Control: 100 g mixture of rice bran and jaggery without insecticide.

Table 3: Bio-Efficacy of Different Insecticide Molecules as Poison Baits with Rice Bran against Larvae of *Spodoptera litura* (Set-I)

Sl. No	Treatment	Dosage (%)	Per Cent Mortality at Different Hours			
			12 Hrs	24 Hrs	48 Hrs	72 Hrs
1	Lambda cyhalothrin 5 EC	100	15.56 (23.23)^{h}	40.00 (39.23)^{h}	57.78 (49.48)^{g}	68.89 (56.10)^{h}
		75	11.11 (19.47)i	28.89 (32.51)^{i}	42.22 (40.52)j	55.55 (48.19)^{i}
		50	6.67 (14.96)^{k}	20.00 (26.57)^{k}	33.33 (35.26)^{l}	44.44 (41.81)^{o}
		25	4.44 (12.17)^{l}	13.33 (21.41)^{l}	24.44 (29.63)^{n}	33.33 (35.26)^{p}
2	Profenophos 50 EC	100	28.89 (32.51)^{e}	68.89 (56.10)^{b}	80.00 (63.43)^{d}	88.89 (70.53)^{d}
		75	22.22 (28.13)^{g}	57.77 (49.47)^{d}	71.11 (57.48)^{e}	80.00 (63.44)^{e}
		50	8.89 (17.35)^{j}	31.11 (33.90)^{i}	46.67 (43.09)^{i}	60.00 (50.77)^{k}
		25	2.22 (8.57)^{m}	22.22 (28.12)^{j}	37.78 (37.92)^{k}	46.67 (43.09)^{no}
3	Chlorpyriphos 20 EC	100	53.33 (46.91)^{a}	73.33 (58.91)^{a}	86.67 (68.58)^{a}	100.00(89.67)^{a}
		75	44.44 (41.81)^{b}	60.01 (50.77)^{d}	79.93 (63.38)^{d}	100.00 (89.67)^{a}
		50	35.56 (36.60)^{d}	44.45 (41.81)^{g}	57.78 (49.48)^{g}	73.34 (58.91)^{g}
		25	24.44 (29.63)^{f}	31.11 (33.90)^{i}	44.44 (41.81)^{i}	66.66 (54.73)^{i}
4	Novaluron 10 EC	100	40.00 (39.23)^{c}	51.11 (45.63)^{e}	62.21 (52.07)^{f}	77.77 (61.87)^{f}
		75	33.33 (35.26)^{d}	44.44 (41.81)^{g}	53.34 (46.91)^{h}	64.45 (53.40)^{j}
		50	22.22 (28.13)^{g}	37.78 (37.93)^{h}	42.22 (40.52)^{j}	51.11 (45.64)^{m}
		25	8.89 (17.35)^{j}	22.22 (28.12)^{j}	28.89 (32.51)^{m}	35.55 (36.60)^{p}
5	Methoxyfenozide 20 SC	100	0.00 (0.00)^{n}	6.67 (14.96)^{m}	35.55 (36.60)^{kl}	80.00 (63.43)^{e}
		75	0.00 (0.00)^{n}	6.67 (14.96)^{m}	26.6 (31.09)^{mn}	64.44 (53.39)^{j}
		50	0.00 (0.00)^{n}	4.44 (12.16)^{n}	20.00 (26.57)^{o}	48.89 (44.36)^{mn}
		25	0.00 (0.00)^{n}	2.22 (8.57)^{o}	8.89 (17.34)^{p}	35.55 (36.60)^{p}
6	Monocrotophos 36 SL	100	53.33 (46.91)^{a}	68.86 (56.08)^{b}	84.44 (66.77)^{b}	97.78 (81.44)^{b}
		75	44.44 (41.81)^{b}	66.67 (54.74)^{c}	81.89 (64.82)^{c}	95.56 (77.83)^{c}
		50	40.00 (39.23)^{c}	57.78 (49.48)^{d}	68.89(56.10)^{e}	80.00 (63.43)^{e}
		25	33.33 (35.26)^{d}	46.67 (43.09)^{f}	57.78 (49.48)^{g}	62.22 (52.08)^{j}
7	Control		0.00 (0.00)^{n}	0.00 (0.00)^{p}	0.00 (0.00)^{q}	0.00 (0.00)^{q}
	S.Em ±		0.440	0.432	0.417	0.564
	CD (P=.0.01)		1.321	1.297	1.253	1.694

Figures in parantheses are arc sin transformed values

Means in the column followed by same alphabet do not differ significantly by DMRT

Control - (Rice bran + jaggery)

Table 4: Bio-Efficacy of Different Insecticide Molecules as Poison Baits with Rice Bran against Larvae of *Spodoptera litura* (Set-II)

Sl. No	Treatment	Dosage (%)	Per Cent Mortality at Different Hours			
			12 Hrs	24 Hrs	48 Hrs	72 Hrs
1	Indoxacarb 15 EC	100	20.00 (26.57)j	53.33 (46.91)^{g}	68.89 (56.10)^{f}	75.56 (60.37)^{e}
		75	15.56 (23.24)^{k}	42.23 (40.53)i	55.56 (48.19)^{h}	62.23 (52.08)^{g}
		50	11.11 (19.47)^{m}	26.67 (31.09)^{k}	44.44 (41.81)^{i}	53.33 (46.91)^{h}
		25	4.44 (12.17)^{o}	15.55 (23.23)^{o}	28.89 (32.51)^{l}	40.00 (39.23)^{j}
2	Chlorfenapyr 10 SC	100	91.11 (72.66)^{a}	100.00(89.67)^{a}	100.0 (89.67)^{a}	100.00 (89.67)^{a}
		75	77.78 (61.88)^{b}	100.00 (89.67)^{a}	100.00 (89.67)^{a}	100.00 (89.67)^{a}
		50	55.56 (48.19)^{c}	88.89 (70.53)^{b}	97.79 (81.46)^{b}	100.00 (89.67)^{a}
		25	37.78 (37.93)^{g}	75.56 (60.37)^{c}	91.12 (72.66)^{c}	100.00 (89.67)^{a}
3	Fipronil 5 SC	100	4.44 (12.16)^{o}	13.32 (21.41)^{p}	22.22 (28.12)^{n}	37.77 (37.92)^{j}
		75	4.44 (12.16)^{o}	8.88 (17.34)^{q}	15.55 (23.22)^{o}	28.88 (32.51)^{k}
		50	0.00 (0.00)^{q}	4.44 (12.16)^{s}	11.11 (19.47)^{p}	17.78 (24.94)^{l}
		25	0.00 (0.00)^{q}	4.44 (12.17)^{s}	8.89 (17.35)^{q}	13.33 (21.42)^{m}
4	Spinosad 45 SC	100	26.67 (31.09)^{j}	42.22 (40.52)^{i}	55.56 (48.19)^{h}	66.67 (54.74)^{f}
		75	20.00 (26.57)^{j}	28.88 (32.51)^{j}	42.22 (40.52)^{j}	48.89 (44.37)^{i}
		50	13.33 (21.42)^{l}	22.22 (28.12)^{l}	33.33 (35.26)^{k}	40.00 (39.23)^{j}
		25	6.67 (14.96)^{n}	17.77 (24.93)^{n}	22.22 (28.13)^{n}	26.67 (31.10)^{l}
5	Chlorantraniliprole 18.5 SC	100	6.67 (14.96)^{n}	20.00 (26.57)^{m}	42.22 (40.52)^{j}	68.89 (56.10)^{f}
		75	6.67 (14.96)^{n}	17.77 (24.93)^{n}	28.89 (32.52)^{l}	48.89 (44.36)^{i}
		50	2.22 (8.56)^{p}	13.32 (21.41)^{p}	24.44 (29.63)^{m}	40.00 (39.23)^{j}
		25	0.00 (0.00)^{q}	6.67 (14.97)^{r}	15.56 (23.24)^{o}	26.67 (31.09)^{l}
6	Monocrotophos 36 SL	100	53.33 (46.91)^{d}	73.33 (58.91)^{d}	86.67 (68.58)^{d}	97.78 (81.44)^{b}
		75	44.44 (41.81)^{e}	68.86 (56.08)^{e}	84.44 (66.77)^{e}	95.56 (77.83)^{c}
		50	40.00 (39.23)^{f}	57.78 (49.48)^{f}	68.89 (56.10)^{f}	80.00 (63.43)^{d}
		25	33.33 (35.26)^{h}	46.67 (43.09)^{h}	57.78 (49.48)^{g}	62.22 (52.08)^{g}
7	Control		0.00 (0.00)^{q}	0.00 (0.00)^{t}	0.00 (0.00)^{r}	0.00 (0.00)^{o}
	S.Em ±		0.234	0.247	0.347	0.543
	CD (P=.01)		0.703	0.742	1.042	1.631

Figures in parantheses are arc sin transformed values

Means in the column followed by same alphabet do not differ significantly by DMRT

Control - (Rice bran + jaggery)

Table 5: Bio-Efficacy of Different Insecticide Molecules as Poison Baits with De-Oiled Rice Bran against Larvae of *Spodoptera litura* (Set-I)

Sl. No	Treatment	Dosage (%)	Per Cent Mortality at Different Hours			
			12 Hrs	24 Hrs	48 Hrs	72 Hrs
1	Lambda cyhalothrin 5 EC	100	8.89 (17.35)^{l}	22.23 (28.13)^{gh}	33.34 (35.27)^{ik}	46.67 (43.09)^{ij}
		75	6.67(14.96)^{m}	20.00 (26.57)^{h}	35.56 (36.61)^{j}	44.44 (41.81)^{j}
		50	0.00 (0.00)^{n}	8.89 (17.34)^{i}	20.00 (26.57)^{l}	22.22 (28.12)^{l}
		25	0.00 (0.00)^{n}	6.67 (14.96)^{i}	13.33 (21.41)^{n}	15.56 (23.24)^{m}
2	Profenophos 50 EC	100	40.00 (39.23)^{d}	62.22 (52.07)^{b}	66.67 (54.74)^{d}	66.67 (54.74)^{f}
		75	31.11 (33.90)^{f}	46.67 (43.09)^{cd}	51.11 (45.63)^{gh}	51.11 (45.63)^{h}
		50	15.56 (23.24)^{j}	40.00 (39.24)^{e}	44.44 (41.81)^{i}	48.90 (44.37)^{hi}
		25	6.67 (14.96)^{m}	20.00 (26.57)^{h}	20.00 (26.57)^{l}	20.00 (26.57)^{l}
3	Chlorpyriphos 20 EC	100	51.11 (45.64)^{a}	77.78 (61.87)^{a}	84.44 (66.77)^{a}	100.00 (89.81)^{a}
		75	42.22 (40.52)^{c}	62.22 (52.07)^{b}	71.11 (57.48)^{c}	100.00 (89.81)^{a}
		50	28.89 (32.51)^{g}	40.00 (39.23)^{e}	53.33 (46.91)^{g}	60.00 (50.77)^{g}
		25	17.78 (24.94)i	22.23 (28.13)^{gh}	46.67 (43.09)^{hi}	51.11 (45.64)^{h}
4	Novaluron 10 EC	100	42.22 (40.52)^{c}	51.11 (45.64)^{c}	62.22 (52.07)^{e}	73.33 (58.91)^{cd}
		75	37.78 (37.93)^{e}	48.89 (44.37)^{c}	55.56 (48.19)^{f}	71.12 (57.49)^{de}
		50	22.22 (28.12)^{h}	31.11 (33.90)^{f}	35.55 (36.60)^{j}	44.44 (41.81)^{j}
		25	11.11 (19.47)^{k}	26.67 (31.09)^{fg}	28.89 (32.52)^{k}	33.33 (35.26)^{k}
5	Methoxyfenozide 20 SC	100	0.00 (0.00)^{n}	6.67 (14.96)^{i}	15.56 (23.24)^{m}	33.34 (35.27)^{k}
		75	0.00 (0.00)^{n}	0.00 (0.00)^{j}	8.89 (17.35)^{o}	22.22 (28.13)^{l}
		50	0.00 (0.00)^{n}	0.00 (0.00)^{j}	6.67 (14.96)^{p}	15.56 (23.24)^{m}
		25	0.00 (0.00)^{n}	0.00 (0.00)^{j}	4.44 (12.16)^{q}	11.10 (19.46)^{n}
6	Monocrotophos 36 SL	100	44.44 (41.81)^{b}	62.22 (52.07)^{b}	75.56 (60.37)^{b}	80.00 (63.43)^{b}
		75	40.00 (39.23)^{d}	51.11 (45.64)^{c}	66.67 (54.74)^{d}	75.56 (60.37)^{c}
		50	37.78 (37.93)^{e}	46.67 (43.09)^{cd}	62.00 (51.94)^{e}	71.11 (57.49)^{de}
		25	31.11 (33.90)^{f}	42.22 (40.52)^{de}	51.11 (45.64)^{gh}	68.89 (56.10)^{ef}
7	Control		0.00 (0.00)^{n}	0.00 (0.00)^{j}	0.00 (0.00)^{r}	0.00(0.00)^{o}
	S.Em ±		0.206	1.067	0.921	0.766
	CD (P=0.01 %)		0.619	3.202	2.763	2.298

Figures in parantheses are arc sin transformed values

Means in the column followed by same alphabet do not differ significantly by DMRT

Control - (Rice bran + jaggery)

Table 6: Bio-Efficacy of Different Insecticide Molecules as Poison Baits With De-Oiled Rice Bran against Larvae of *Spodoptera litura* (Set-II)

Sl. No	Treatment	Dosage (%)	Per Cent Mortality at Different Hours			
			12 Hrs	24 Hrs	48 Hrs	72 Hrs
1	Indoxacarb 15 EC	100	20.00 (26.57)^{k}	40.00 (39.23)^{hi}	55.56 (48.19)^{g}	62.22 (52.07)^{g}
		75	15.56 (23.24)l	24.45 (29.64)^{k}	40.01 (39.24)^{k}	44.45 (41.81)^{j}
		50	11.11(19.47)^{m}	22.22 (28.12)^{kl}	28.89 (32.51)^{n}	33.33(35.26)^{kl}
		25	4.44 (12.16)o	19.99 (26.56)^{l}	28.88 (32.51)^{n}	31.10 (33.90)^{l}
2	Chlorfenapyr 10 SC	100	88.89 (70.53)^{a}	100.00 (89.67)^{a}	100.00 (89.67)^{a}	100.00 (89.67)^{a}
		75	77.78 (61.87)^{b}	93.33 (75.04)^{b}	100.00 (89.67)^{a}	100.00 (89.67)^{a}
		50	62.22 (52.07)^{c}	77.78 (61.88)^{c}	91.11 (72.66)^{b}	97.78 (81.43)^{b}
		25	42.22 (40.52)^{e}	60.00 (50.77)^{e}	73.33 (58.91)^{d}	82.22 (65.06)^{c}
3	Fipronil 5 SC	100	0.00 (0.00)^{p}	20.00 (26.57)^{l}	44.44 (41.81)^{j}	48.88 (44.36)^{h}
		75	0.00 (0.00)^{p}	15.56 (23.23)^{m}	44.44 (41.81)^{j}	46.67 (43.09)^{i}
		50	0.00 (0.00)^{p}	11.11 (19.47)^{n}	35.56 (36.60)^{l}	44.45 (41.81)^{j}
		25	0.00 (0.00)^{p}	8.89 (17.35)^{o}	31.11 (33.90)^{m}	35.55 (36.60)^{k}
4	Chloranthraniliprole 18.5 S	100	26.67 (31.09)^{i}	37.78 (37.93)^{i}	48.89 (44.36)^{i}	68.89 (56.10)^{ef}
		75	22.22 (28.12)^{j}	31.11 (33.90)^{j}	31.11 (33.90)^{m}	66.66 (54.73)^{f}
		50	13.33 (21.42)^{l}	20.00 (26.57)^{l}	20.00 (26.57)^{q}	60.00 (50.77)^{g}
		25	6.67 (14.96)^{n}	11.11 (19.47)^{n}	22.22 (28.13)^{p}	48.89 (44.36)^{h}
5	Spinosad 45 SC	100	6.67 (14.96)^{n}	22.22 (28.13)^{kl}	35.56 (36.60)^{l}	75.56 (60.37)^{d}
		75	6.67 (14.96)^{n}	15.56 (23.23)^{m}	24.44 (29.63)^{o}	71.11 (57.49)^{e}
		50	6.67 (14.96)^{n}	8.89 (17.35)^{o}	17.78 (24.94)^{r}	68.89 (56.10)^{ef}
		25	0.00 (0.00)^{p}	6.67 (14.96)^{p}	15.56 (23.23)^{s}	68.89 (56.10)^{ef}

Table 6: Contd.,

6	Monocrotophos 36 SL	100	44.44 (41.81)^{d}	62.22 (52.07)^{d}	75.56 (60.37)^{c}	80.00 (63.43)^{c}
		75	40.00 (39.23)^{f}	51.11 (45.64)^{f}	66.67 (54.74)^{e}	75.56 (60.37)^{d}
		50	37.78 (37.93)^{g}	46.67 (43.09)^{g}	62.00 (51.94)^{f}	71.11 (57.49)^{e}
		25	31.11 (33.90)^{h}	42.22 (40.52)^{h}	51.11 (45.64)^{h}	68.89 (56.10)^{ef}
7	Control		0.00 (0.00)^{p}	0.00 (0.00)^{q}	0.00 (0.00)^{t}	0.00 (0.00)^{m}
	S.Em ±		0.349	0.578	0.378	0.688
	CD (P=0.01 %)		1.047	1.736	1.135	2.065

Figures in parantheses are arc sin transformed values

Means in the column followed by same alphabet do not differ significantly by DMRT

Control - (Rice bran + jaggery)